

The diagram illustrates a control system for a camshaft actuator. The main components and their interconnections are as follows:

- Set point 12**: Provides the reference value to the **Control law 18**.
- Control law 18**: Receives feedback from the **Phase measurement 26** and outputs a signal to the **solenoid 20**.
- solenoid 20**: Drives the **Spool valve 14**.
- Spool valve 14**: Controls the **Actuator Flow v. Spool position**, which is represented by a graph showing a parabolic relationship.
- Actuator Flow v. Spool position**: The output of the valve, which is also labeled as **Cam shaft torque**.
- Cam shaft**: The mechanical output of the system, represented by a vertical line with a downward arrow and labeled  $\theta$ .
- Cam shaft measurement pulses**: Generated from the cam shaft position and sent to the **Phase measurement 26**.
- Crank shaft measurement pulses**: Generated from the crank shaft position and sent to the **Phase measurement 26**.
- Phase measurement 26**: A central processing unit that receives both measurement pulses and outputs a feedback signal  $\theta_o$  to the **Control law 18**.
- 22** and **24**: Represent the crank shaft and cam shaft respectively, with sensors **22a** and **24a** detecting their positions.

The **controller** block, which includes the **Set point 12**, **Control law 18**, and **Phase measurement 26**, is enclosed in a dashed box.

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Fig. 1A

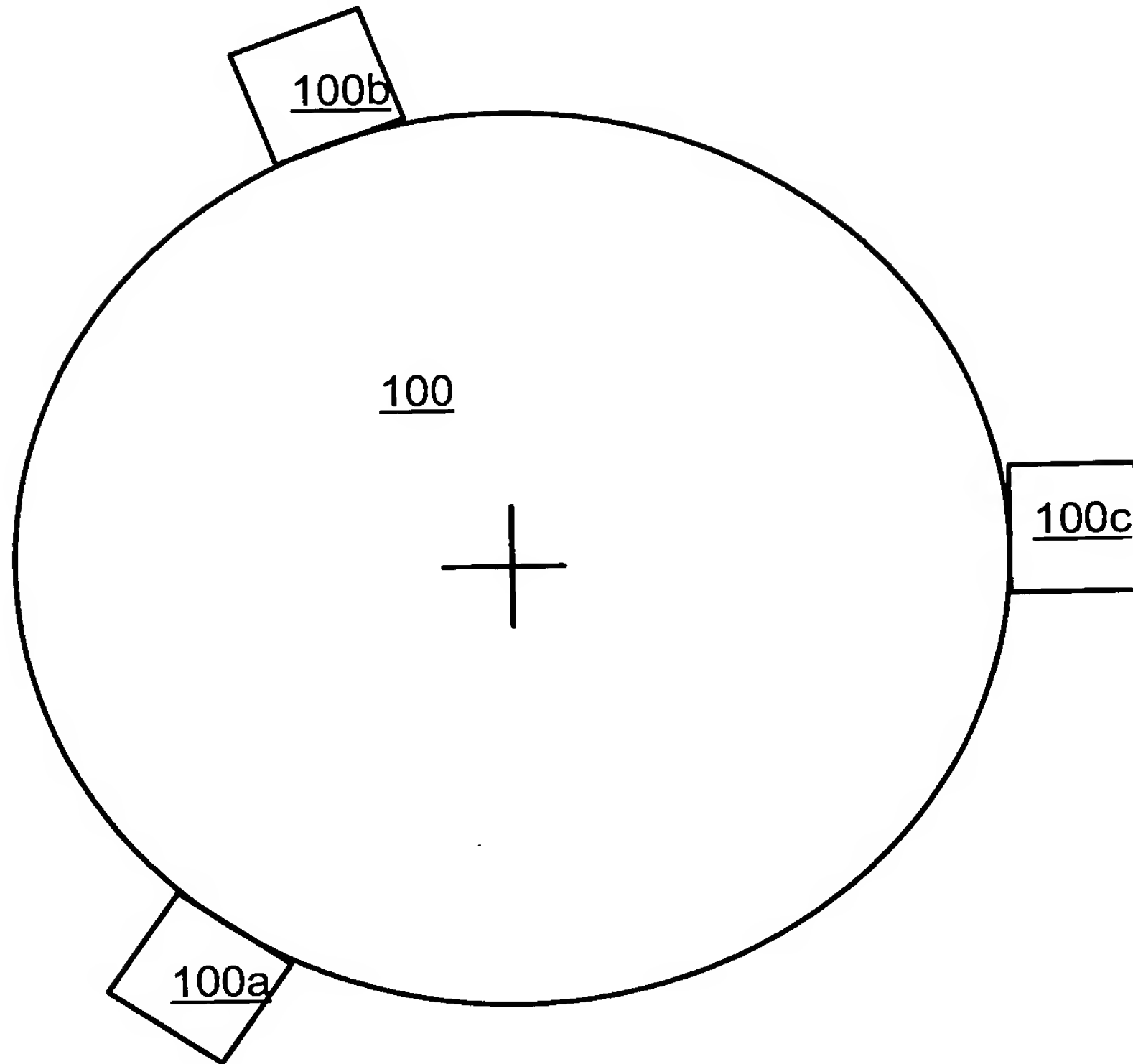
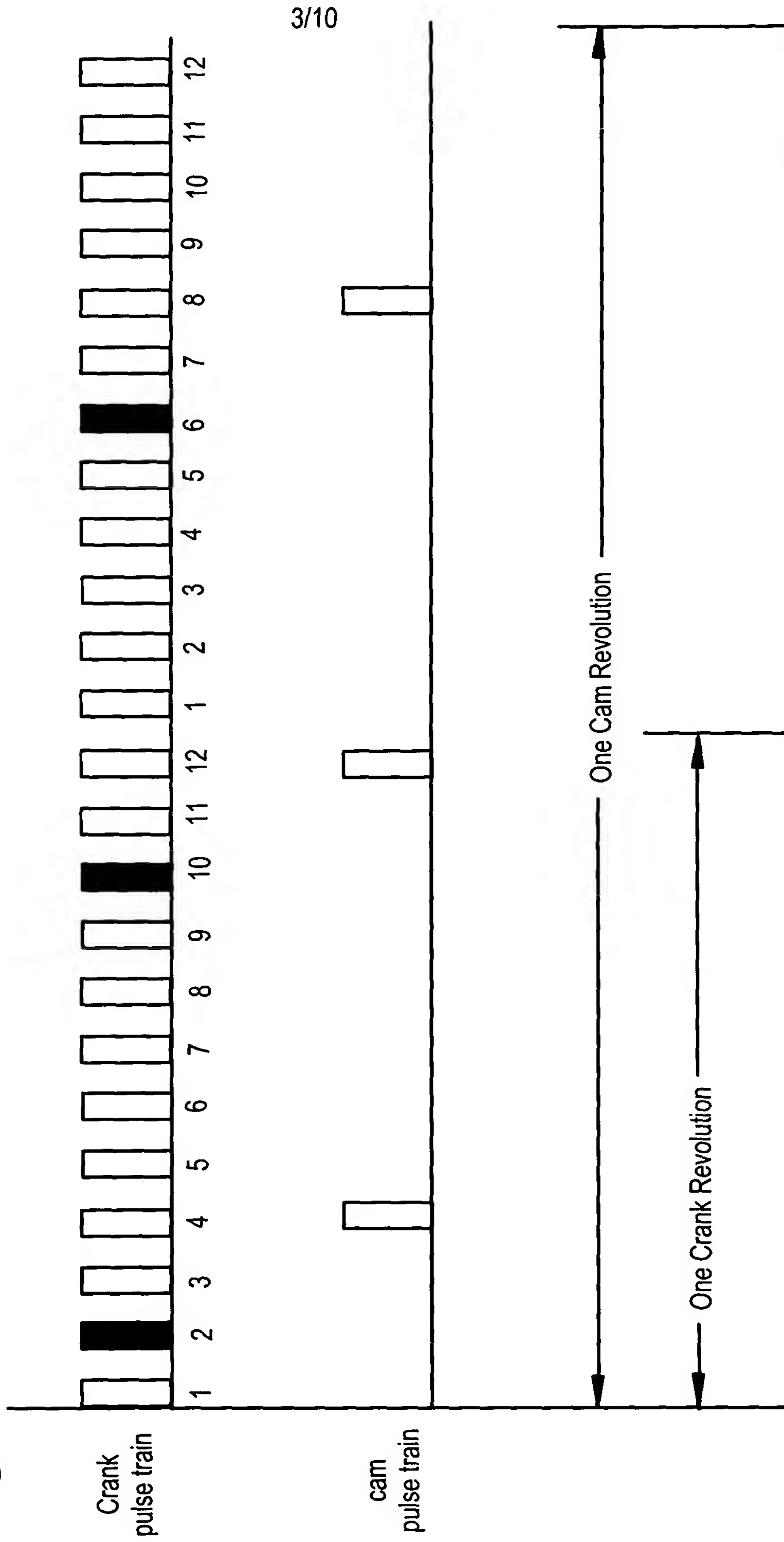


Fig. 2



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Fig. 3

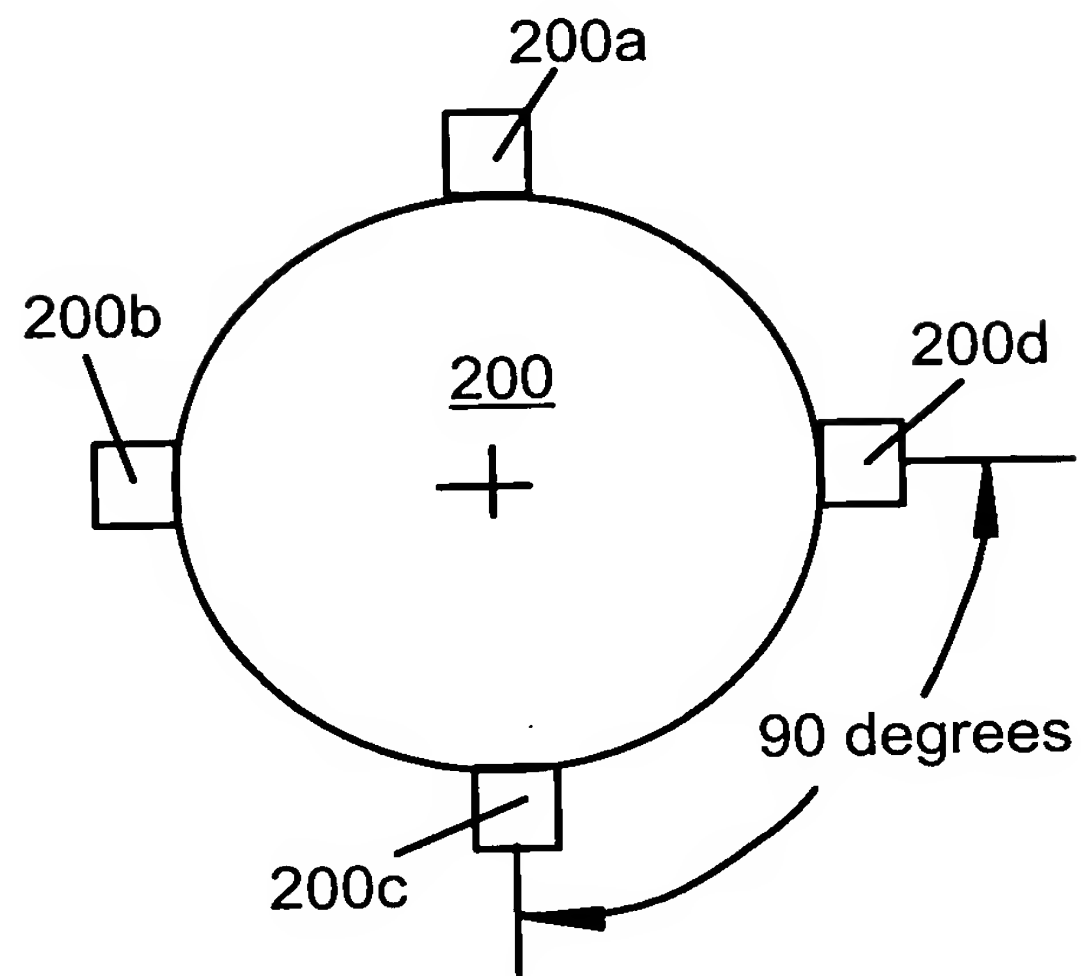
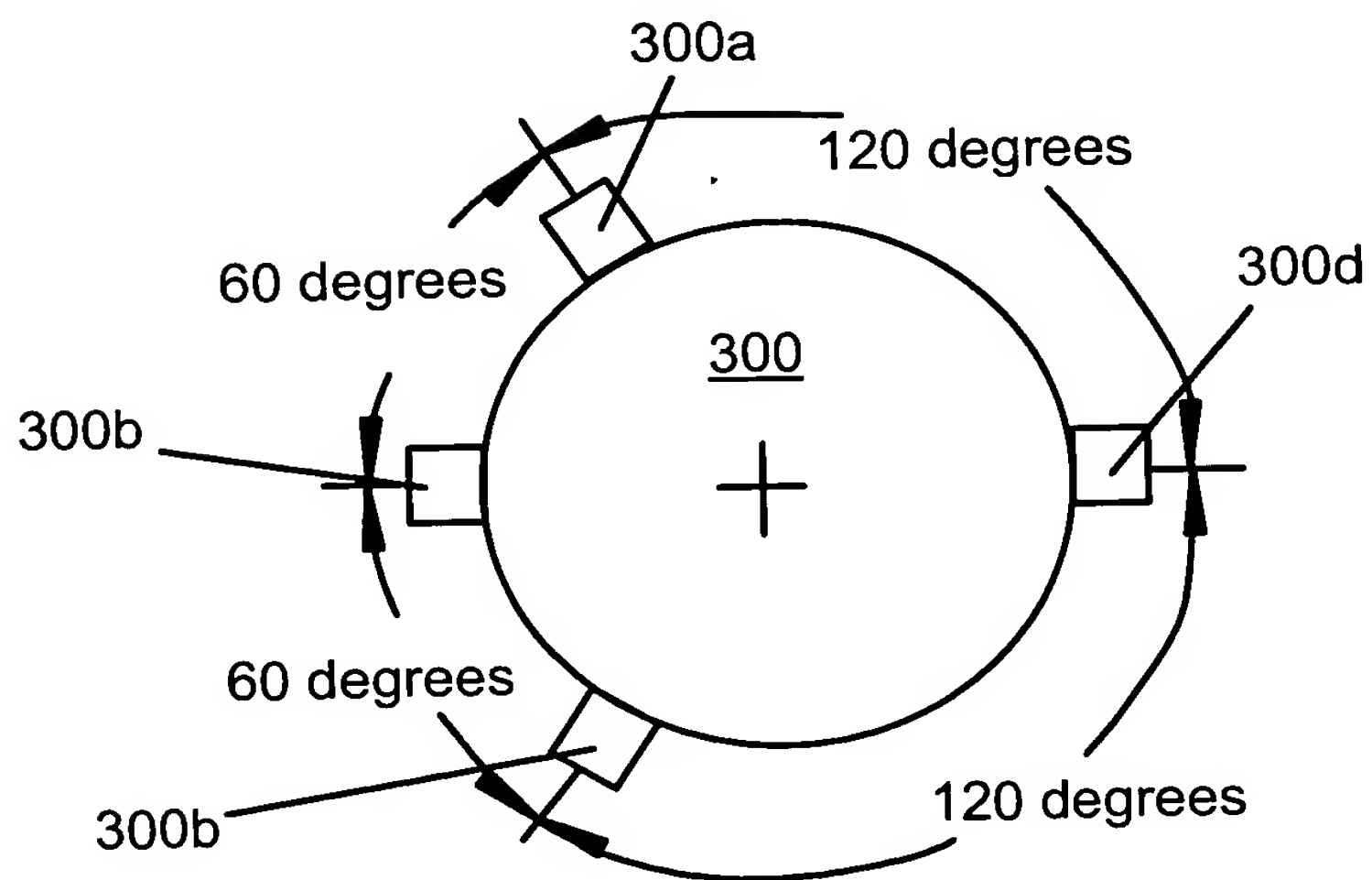
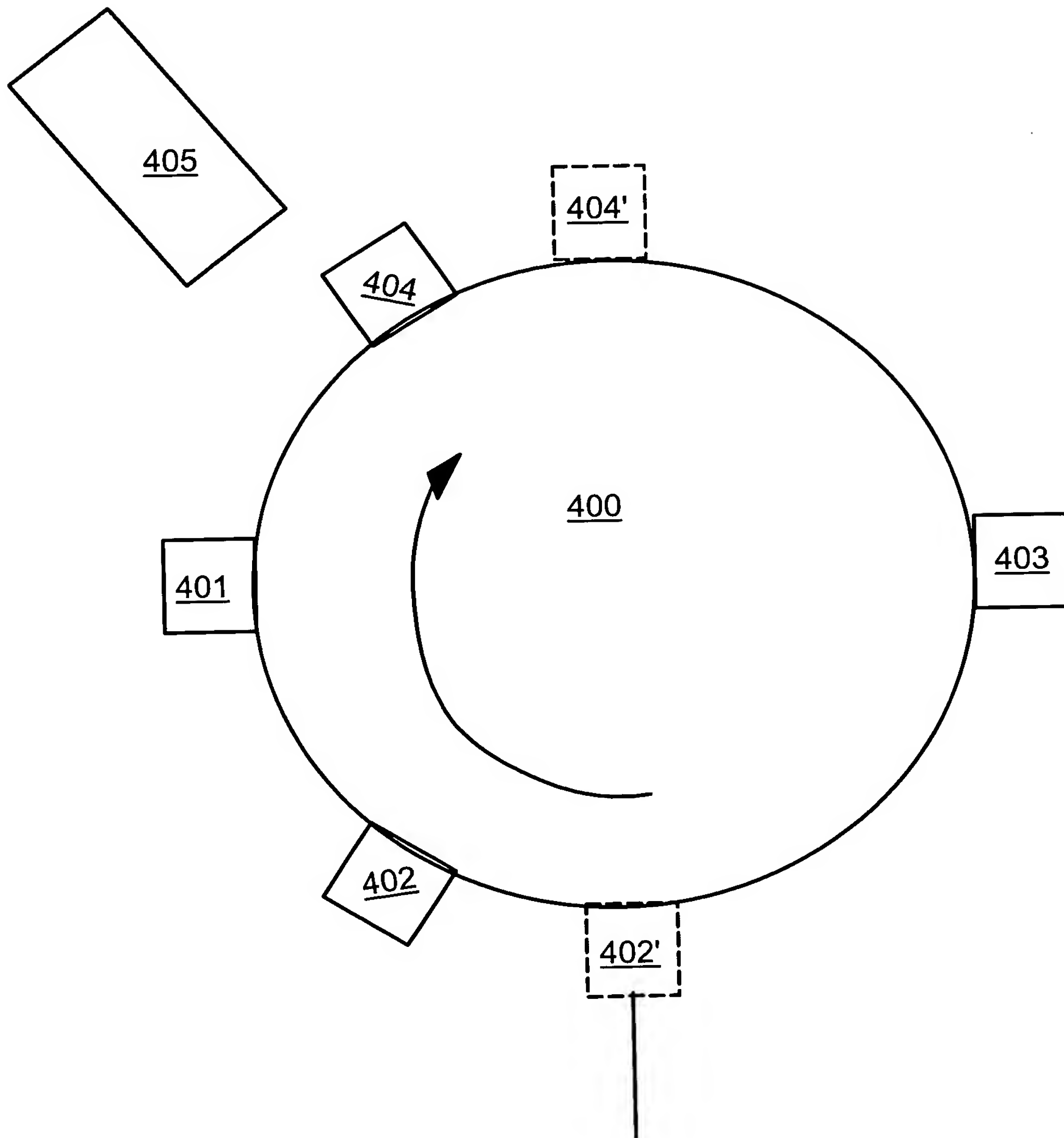


Fig. 4



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Fig. 5



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Fig. 6

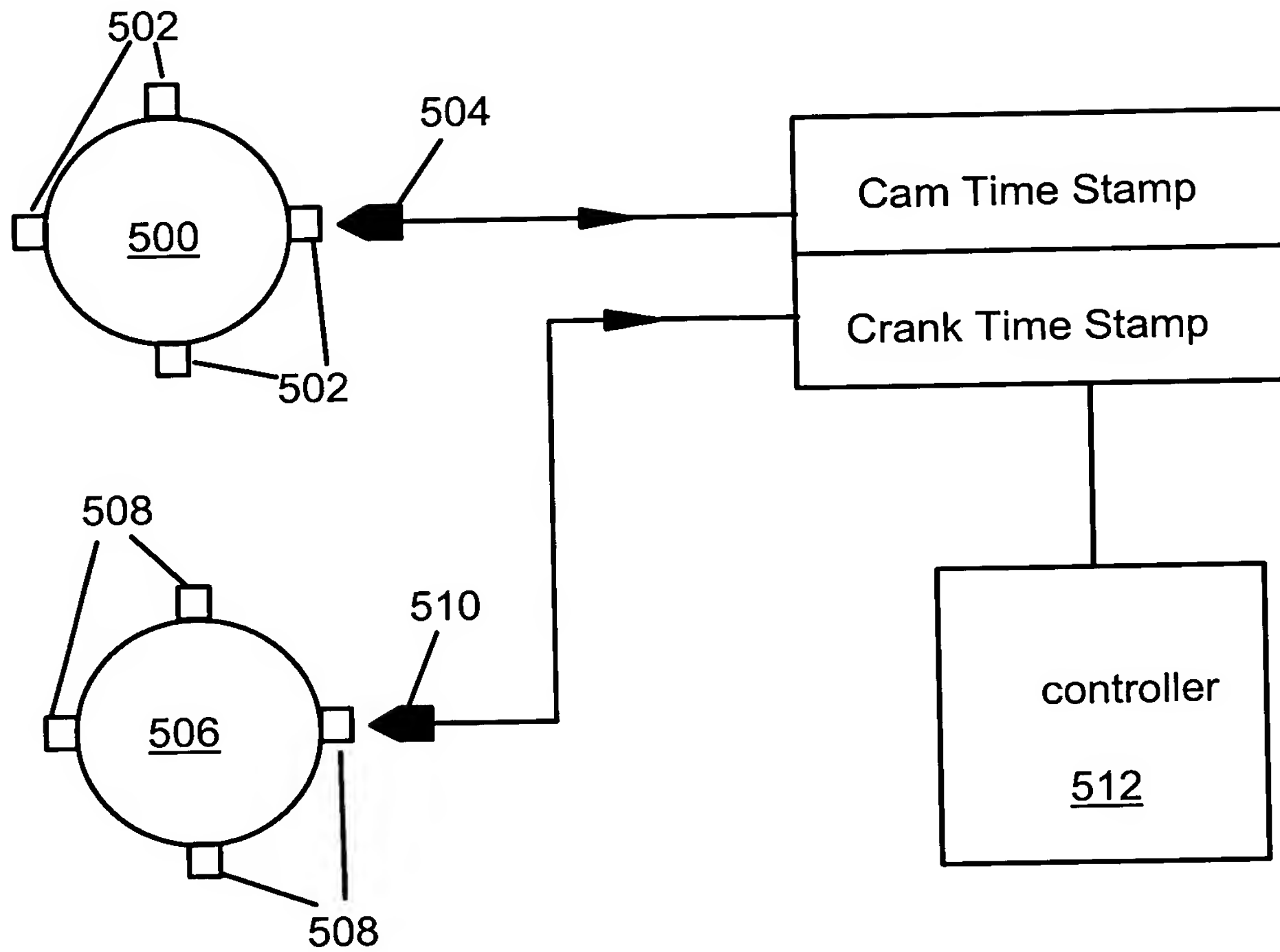
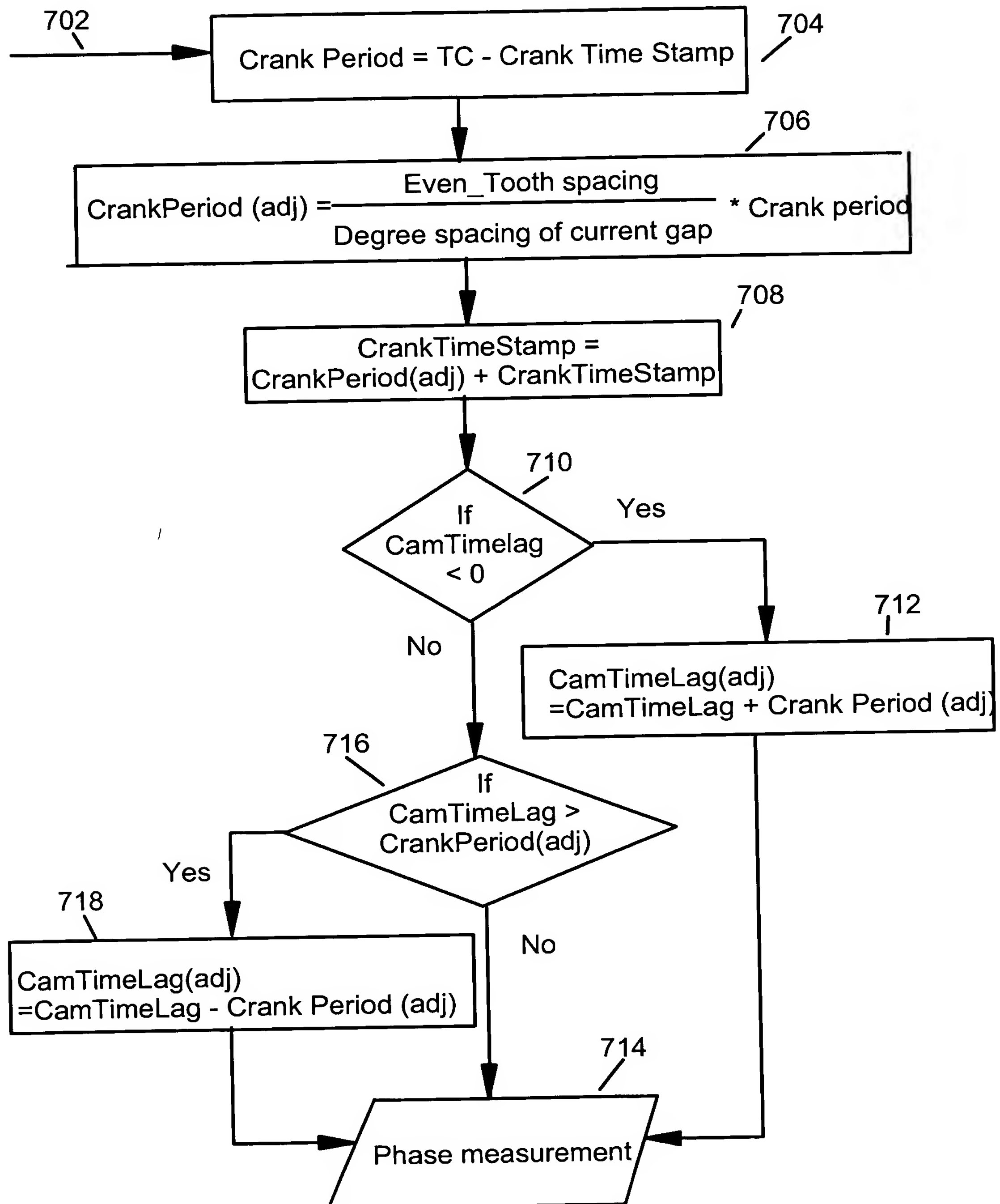


Fig.. 7      7/10      Crank non-symmetric, Cam symmetric      700

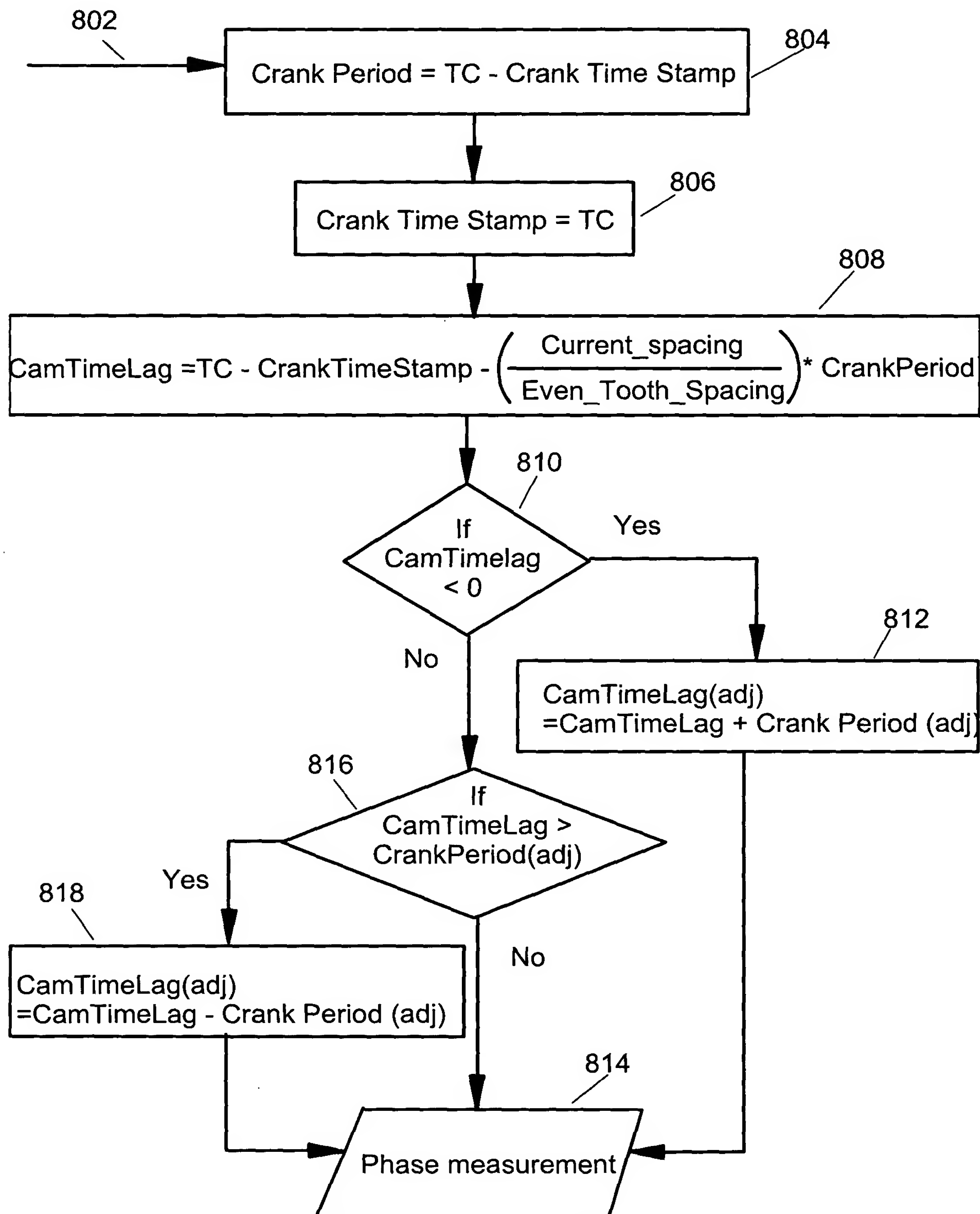


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Fig. 8

Crank symmetric, Cam non-symmetric

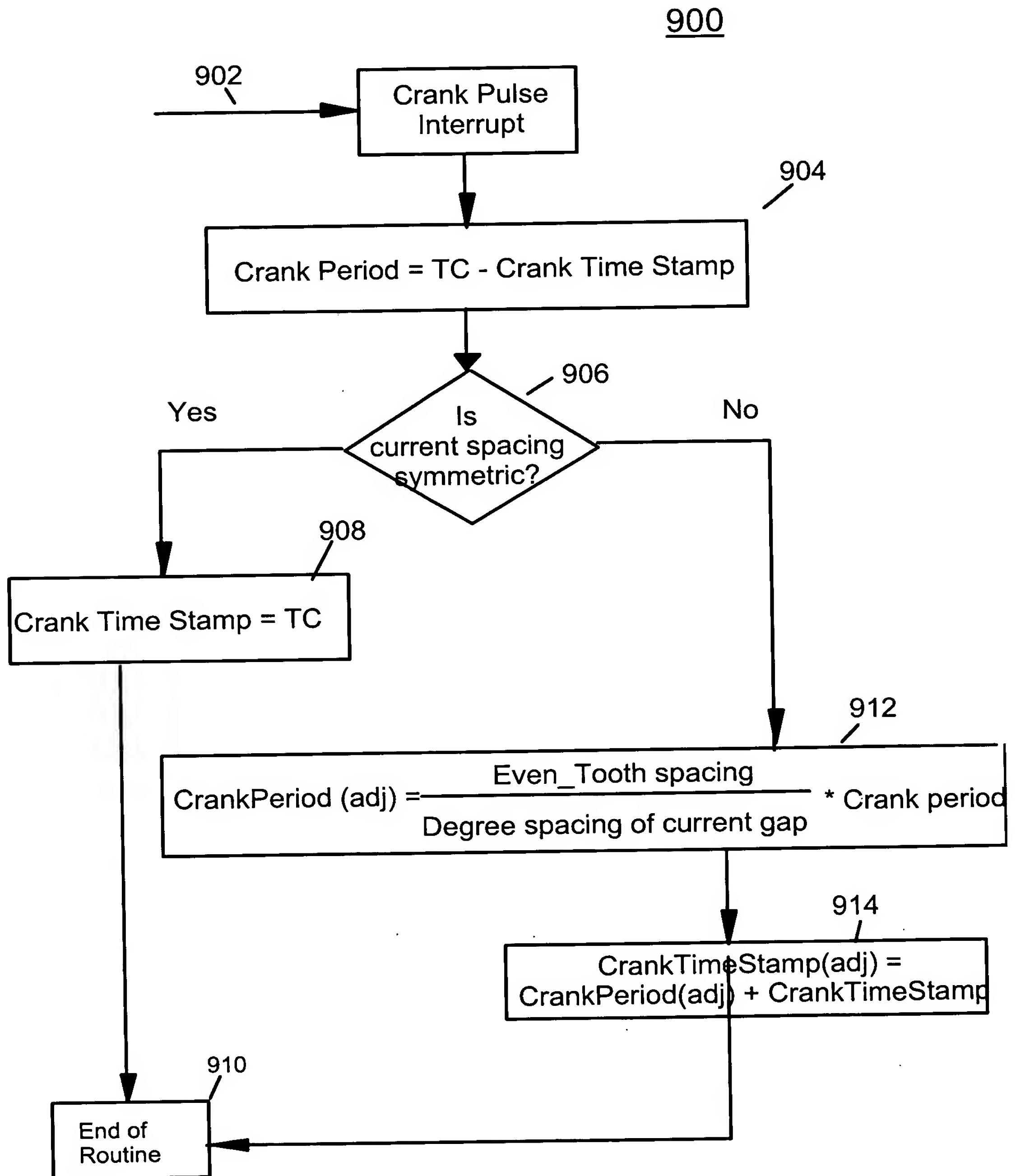
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Fig.. 9



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Fig. 10

